7. River Channel Depths and Substrate Characteristics

Expectation: Reestablishment of historic river channel morphology and substrate characteristics. Accumulated organic depositions will be flushed out of remnant river channels or covered with sand, and the substrate of the riverbed will return to predominantly sand. Channel cross sectional area will increase by 10 – 15 percent, and morphology will be typical of C5 and DA5 stream types with straight sections forming U-shaped channels, and river meanders having deep scouring on outside banks and deposition on inside banks.

Author: Pat Davis, South Florida Water Management District.
Don Frei, South Florida Water Management District

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Relevant Endpoints: Ecological Integrity/Restoration/Physical Integrity - river channel substrate characteristics
Ecological Integrity/Restoration/Physical Integrity - hydrogeomorphic processes

Baseline Condition: An organic deposition layer composed of dead and decomposing plant litter has accumulated in all remnant river channels since channelization. In 1997-1999, core samples were taken along 107 transects in remnant river channels in Pools A, B and C. The median thickness of organic deposition layers was 15.41 cm, and 68% of the point samples had organic accumulations >5 cm. Deposition layers were thickest in deeper parts of the channel around curves and on gently sloping bottoms along straight stretches of river.

Variation in the median thickness of the accumulated organic deposition layer in remnant river channels may be due to tributary inflows. Median thickness in MacArthur Run (10.99 cm), Micco Bluff (12.55 cm), and Montsdeoca Run (11.06 cm), which have some tributary inflow, was less than half of the deposition layer thickness in Oxbow 13A (25.86 cm) and Oxbow 13 (23.31 cm), which have no tributary inflow.

Reference Condition: The historic geomorphology of the Kissimmee River featured sandy substrates, meandering channels, and point bar formations. According to the classification of Rosgen (Rosgen, 1994,1996), the Kissimmee River was a C5 stream, which are typically low-gradient, meandering, sinuous streams with point bars, and slightly entrenched relatively narrow and deep channels with sandy substrates. In some stretches, the Kissimmee River resembled a DA5 stream system, which is a low gradient, anastomosing (multiple channel) system, with a high channel width to depth ratio and sandy substrates.

Partial flow including near or bankfull discharges for 233 - 307 days, was reestablished in 3 remnant river runs in Pool B (R1, R2, and R3) during the Demonstration Project of 1985-1988. During this period a significant decrease in the depth of organic deposits was recorded along 23 of 25 river cross sections and an average of 66 percent of the cross sectional area of organic deposits was either swept away by flow or covered with a layer of clean sand. Mean thickness of organic deposits fell from 16.8 cm to 7.1 cm in R1, 16.5 cm to 3.1 cm in R2 and 14.8 cm to 7.8 cm in R3. No measurable organic deposits were found at 60 percent of point samples in R1 and R2, and 46 percent of bottom samples in R3. Due to reduced organic deposits, most sites showed an increase in cross sectional area. In addition, channel shape was altered at 10 sample sites, where cross sections changed from a uniformly shallow, saucer shaped channel to a deeper U-shaped channel on straight river runs and a deep channel opposite a sand bar on curves (Toth, 1991).

Preliminary analysis of baseline core sampling data taken in Pools A, B and C showed that the channel morphology and substrate beneath the organic layer were consistent with the characteristics associated with C5 and DA 5 river systems.

Mechanism for Achieving Expectation:

Restoration is dependent on duration of discharge. Reestablished flow in remnant river channels will flush organic material or redistribute sand to cover existing organic layers. Changes in channel morphology will vary with river pattern. Flushing of organic deposition layers also will be affected by plant growth along riverbanks. Nuphar luteum and Polygonum densiflorum can trap sediment in roots and hinder flushing of the depositional layer.

Some silting of existing channels may occur during construction. Backfilling of the canal may cause siltation and new river channels may be unstable and susceptible to erosion until riparian vegetation communities reestablishes. Post construction monitoring of the Test Fill Project indicated some erosion when heavy rainfall required discharges through the test plug area (Chamberlain, 1997).

Adjustments for External Constraints:

None

Means of Evaluation:

Evaluation parameters will include the presence or thickness of an organic layer, channel morphology, and cross sectional area. Sampling of baseline stations in Pool B and C will begin after near or bankfull discharge has occurred, and will be conducted biannually to evaluate changes. Core sampling along these established transects will be used to detect changes in organic layer thickness and to monitor changes in channel morphology. A net change in area along the transect allows for quantification of net degradation or aggregation of sediments in the channel (Olson-Rutz and Marlow 1992). Absolute percent change allows for quantification of cumulative streambed or stream bank material movement. The width/depth ratio will be used as a relative index of channel shape (Beschta and Platts, 1986). The Gini coefficient will be used to describe the cross sectional profile and whether the channel is becoming wider and flatter or narrower and deeper (Olson-Rutz and Marlow 1992).

These data will be used to evaluate changes in remnant channel characteristics to that typical of a proper functioning C5 or DA5 stream type.

Time Course:

Based on results of the Pool B Demonstration Project flushing of organic deposition layer and geomorphic changes to the Kissimmee River channel should occur within three years after reestablishment of natural surface water discharge characteristics

References

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